

RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM GENERATOR.—Henry C. Christoper, Meridian, Miss. In this generator the gaseous products of combustion are conducted from the furnace proper into the water space, to more fully utilize the heat and economize fuel. The combustion chamber is located in and entirely surrounded by water in a primary boiler, and the upper end of the combustion chamber is connected by a flue and valved pipe with a second boiler, into which the gases and products of combustion are discharged from a submerged outlet, the gaseous products of combustion being mingled with the steam in the second boiler, and used therewith in driving machinery, etc. The two boilers are so connected that an even pressure may be maintained in both, and steam may be taken from either or both of them as desired.

BOILER ATTACHMENT.—William I. Miller, Atchison, Kansas. To prevent freezing in the feed pipe of a boiler, more especially a locomotive boiler, this invention provides an attachment which allows a circulation of hot water through the pipe when the feed pump or injector is not working. The main or boiler check valve and the lower intermediate valve are each provided with a small passage to permit the leaking of hot water around and past the valves when the feed or injector is not in operation, the leak of the intermediate valve being always open, and the other subject to control, the feed pipe being thus always kept clear without affecting the ordinary operation of the feed.

GAGE COCK.—George Johnson, Allentown, Pa. According to this invention a casing secured to a boiler has at its inner end a valve seat, the valve being seated by pressure from the boiler, and the stem of the valve extending through the casing and a stuffing box, while a cam on the stem is adapted to engage a cam surface on a cam attached to the casing. The device is not liable to get out of order, as it is without springs or other breakable parts, and leakage is completely avoided, as the valve is held firmly to its seat by the boiler pressure, and is always ground in its seat on opening and closing.

Railway Appliances.

CAR VENTILATOR.—Andrew J. McArthur, Gainesville, Fla. For refrigerator cars, this invention provides a simple and strong ventilator which may be elevated in sections in either direction with relation to the hatchway, and may be swung wholly away from the hatchway. The invention comprises a hatchway having walls extended above the car roof, a frame hinged to the hatchway carrying a screen, while a cover in two sections is hinged to swing, one relatively to the other, there being means for removably securing the sections to the frame and holding either one of them in open position.

REFRIGERATOR DOOR.—The same inventor has likewise obtained a patent for a door more particularly adapted for cars and cold storage rooms, the door being so made that it may be easily opened, and when closed will form a practically airtight joint between the door and its casing. Arranged between the door and jamb is a packing, preferably of tubular rubber, the door having inner and outer walls forming an air chamber, which may be packed with charcoal, sawdust, etc.

CAR DOOR.—John M. Smith, Van Wert, Ohio. In freight car doors mounted to slide, this invention provides a simple and economic device, applicable to any sliding door, and designed to render the door storm proof, dust proof, and burglar proof. An angle iron lies against one side of the door frame, and is held capable of adjustment toward and from the door, a wing being pivoted to the angle iron and a latch holding the wing in connection with the door. The door does not bind at the bottom, and the locking and sealing devices are so mounted that the door may be as readily opened when the sides of the car are bulged or sprung outward by heavy loading as when the car is unloaded.

STREET TRAMWAY TRACK CLEANER.—Louis Lege, Hanover, Germany. An instrument adapted to run along the rail and scrape off accumulations therefrom has been devised by this inventor. It is attached by means of a post to the under side of the car floor, and has a receptacle adapted to receive material from the track the receptacle having rearwardly and outwardly extending branches to deliver the material at the sides of the track, and the cleaner having a tongue which runs in the groove of the rail.

Mechanical.

GRINDING MACHINE.—George W. Kirsten, West Orange, N. J. For grinding spherical or curved surfaces and twists of various kinds, this machine is arranged to properly support and adjust the work, and to hold the grinding wheel in the desired position, according to the shape to be given to the cutting edge. The machine has a carriage adapted to travel backward and forward, and holding an adjustable head with holder carrying a grinding wheel mounted to turn in the head, there being means for adjusting the holder laterally in the head. The operator is only required to adjust the work on the centers and adjust the grinding wheel vertically according to the edge desired.

MATTRESS TUFTING MACHINE.—Edward B. Dixon, Grantsborough, N. C. This invention covers an improvement in machines in which a series of pairs of needles are forced up through the mattress while held by suitable clamps on a suitable bed or frame. It is designed to enable the needles to be raised and forced up through a mattress with greater ease than heretofore; reduce the weight, number and cost of parts; provide lateral guides or holders for the mattress while on the frame, and make such guides vertically adjustable to accommodate mattresses of different thicknesses, while also providing a temporary holder for the tufts.

PUMPING POWER.—George W. Grimes, Bluffton, Ind. This invention provides a simple and powerful machine by which the pumps of several surrounding wells may be simultaneously operated, all the parts of the machine being conveniently assembled, and

a large frame and supporting rods being dispensed with. Eccentrics and a power wheel are mounted to rotate on a tapered post, the lower end of the post engaging a socket in a base on which is an adjustable bearing plate having an annular channel, there being an upper bearing plate on which the hub of the power wheel rests.

Agricultural.

TREE PROTECTOR.—Charles C. Coulson, Riverside, Cal. This improvement embraces a series of frames connected by tracks on which canopies are adapted to slide, foot blocks resting on the ground supporting the frames, and stakes engaging the foot blocks, whereby the frames may be readily moved to a recumbent or upright position. It is designed more especially for use in climates liable to a frost on still and clear nights, as a protector also for large plants or vines, being quickly set up and taken down.

CLOD CUTTER.—Peter R. Campbell, Brierfield, Miss. This is a cultivating apparatus supported by runners, in which the clods are broken by knives or blades held to run along the ground. A knife frame is employed carrying longitudinal blades, and there are plovshares which throw the earth inward as the machine passes along the ground. The cutters have saw blades adapted to travel through the hardest clods with a minimum expenditure of power.

ROOSTING DEVICE FOR FOWLS.—Fred D. Dimock, National City, Cal. For a poultry house or similar inclosure, this invention provides a device adapted to remove the droppings of the fowls and deposit them in a suitable receptacle outside the house. The roosting poles are arranged in a tier, and below them is a longitudinally adjustable endless apron, the apron being mounted on rollers and extending through an aperture in the inclosure. A scraper blade is mounted adjacent to the outside roller, by which the material on the apron may be removed.

FENCE.—Bennett T. Hoshall, Shamburg, Md. This is a fence in which the rails, riders and stakes are bound together by wire locks, the rails of adjacent panels lapping at their ends against the post, and the wire ties passing over each of the rails near their extremities, thence under another rail and having a portion passed around the post. The several locks may be clamped to the post by nails or staples.

COW MILKING APPARATUS.—Modestus J. Cushman, Waterloo, Iowa. In this apparatus both suction and traction are simultaneously applied to the animal's teats, the main parts of the apparatus comprising an air pump, milk receptacles, a rigid milk conducting pipe extending horizontally the length of the cow stall in front of the stanchions, and a series of attachments or sets of teat cups connected by flexible branch tubes with the main conductor, there being means of applying traction to the branch tubes. An automatic vacuum apparatus and a water receptacle or holder are connected with the main milk conductor by branch tubes. A novel vacuum regulator is provided, and also means of readily adjusting the degree of traction to be employed.

Miscellaneous.

RECEIVER FOR GASES OR LIQUIDS.—Rudolf Kelling, Eschweiler 2, Prussia, Germany. In order that large receivers may be made of sheet metal, this inventor provides the receivers around their base with an exterior shell forming a space adapted to receive a filling, such as water, which will partly counterbalance the outward pressure of the contents of the receiver. Such receivers, when used as water tanks, etc., when made of extra large size or height, have had to be made of or strengthened with concrete or brickwork, a necessity which the improved construction provided for by the patent is designed to obviate.

PROCESS OF MAKING NITRITES.—August Knop, Rheinau, Germany. For the manufacture of alkali nitrites, this inventor subjects to the action of heat a mixture of a nitrate of the same alkali, the caustic alkali of the same element, and carbon, according to a specially devised process designed to afford great economical advantages, the process rendering possible the use of carbon in its cheapest form by adding a certain quantity of caustic alkali to the molten nitrate. It is claimed that it is possible to produce in the same time nearly twice as much nitrite as can be made by the lead process, with a corresponding economy of fuel and wages, the amount of coke consumed being insignificant.

IRONING TABLE.—William R. and Edward N. Murray, Parramatta, New South Wales. This is a table adapted for use as an ordinary kitchen table, and readily convertible into an ironing board. It has four legs rigidly joined at the top and bottom by rails, the lower rails supporting a leaf and the upper ones carrying a ledge forming part of the top of the table. The removable top of an ordinary kitchen table is supported by cleats, and a leaf adapted to be used as an ironing board may be readily placed in position, either leaf when not in use being held out of the way.

CLEANING WATER HEATERS.—George J. Dehn, Iron Mountain, Mich. To prevent the accumulation of lime or similar matter in boilers, water back or front ranges and connecting pipes, this invention provides simple means for automatically supplying a compound to the water to prevent lime, etc., from adhering to the interior surfaces. On a length of pipe designed for connection with the feed pipe is a vessel in which the compound is placed, the cover of the vessel being removed for that purpose and afterward secured in position, when, on opening valves arranged for the purpose, the compound is fed in through the feed pipe.

HEARSE.—James Burns, Cincinnati, O. This hearse is provided with a table for carrying a casket, and that slides forward and backward, admitting of very readily placing the casket in the hearse or removing it therefrom. By the adjustment of brackets the table may be held in any desired position, or it may be taken out entirely for cleaning purposes. The table may also be lowered so that the pall bearers may with greater convenience, place the casket on the table.

FIRE EXTINGUISHING APPARATUS.—Joseph O. Banning, New York City. To facilitate handling and operating storage cylinders for fire extinguishing solutions, this inventor has devised a pump which will not siphon and whose handle may be locked when not in use, the pump having ball valves of metal to secure more perfect continuity of ejecting power, while the cylinder cover is provided with a removable liquid-tight cap which may be quickly adjusted or detached.

CIGAR OR CIGARETTE HOLDER.—George B. Schmitt, New York City. This device comprises a base portion provided with a pin, and from which extends a wire bent upon itself at its outer end to form an open loop or socket adapted to receive the end of a cigar or cigarette. The cigar, cigarette, cigar holder or pipe, carried by the device, may be brought to the mouth and held in proper position for smoking, leaving both hands of the smoker free. The device may also be used for holding a pen, pencil, etc.

STIRRUP.—William H. Wilson, Nocona, Texas. To so construct a stirrup as to prevent its strap bar from hurting the instep of the user and wearing his trousers is the object of this invention, the strap bar being offset with respect to the tread bar and rigidly connected therewith, the strap bar being relatively in advance of the tread bar and held from binding against the leg or instep when the foot is inserted to cause the heel to bear against the tread bar. There is no danger of the foot being caught in the stirrup in the event of the rider being thrown.

VEHICLE WHEEL.—Philip J. Parker, Brooklyn, N. Y. The tire of this wheel is formed of a series of tubular sections with closed ends, there being an air tube within the inner periphery of the rim from which posts lead into the tire, while valves in the sections of the tire are provided with tubes projecting into the openings of the air tube. By this means a puncture may be quickly located, and each section of the tire may be independently inflated or all or any of the sections may be inflated together. The invention is designed for bicycles, or for sulkies, road wagons and other vehicles.

BUCKLE.—Chrystie F. Nicholson, New York City. This invention relates principally to buckles for belts, and provides a buckle that is cheap to manufacture while it is also light and strong. The buckle blank consists of a single piece of sheet metal, which comprises the loop portion, short integral tongue, rear transverse bar and tang, etc.

Designs.

PLAYING CARD.—Michael F. Carey, Albany, N. Y. The leading feature of this design consists in diagonal lines extending over the face of the card and dividing it into fields of an approximately triangular shape.

GUARD FOR KEYS.—Thomas M. Hilliard, New York City. This design relates to a sheath or guard for a bunch of keys to prevent keys worn on the person from marring furniture, etc., the sheath being approximately bell-shaped, and its upper end being adapted for connection with a belt to be worn around the person.

PLOW STOCK.—John W. Barnard, Shannon, N. C. This stock has an upright section terminating at its upper end in a fork, and a lower horizontal section representing a landside, with a shoe at its outer free end, there being in the side surface of the horizontal section a longitudinal depression.

TOE CLIP.—David Basch, New York City. This design relates to toe clips for bicycle pedals, and comprises rear lips continuous with the base, the base, toe guard and side guards being otherwise of the usual shape, while a pendant member extends downward from the rear end of the base.

BELT.—William H. Carr and John G. Wolf, New York City. This design relates to inside belts to be worn between the waistband of the skirt and the corset cover or corset, and the central back portion of the belt is slightly projected outward and has an angular slot adapted to receive and engage with a button.

TACKLE BLOCK.—Thomas R. Ferrall, Somerville, Mass. The leading feature of this design consists in the cheek pieces of the block, which are elliptical in contour and have ends extending substantially to a point, the cheek pieces having circular ornamentation.

LEMON SQUEEZER.—George R. Blake, Winchester, Va. This design is for a squeezer adapted to rest upon a glass, the base portion having centrally grouped segmental openings, and there being an upwardly extending central cone in which are vertical corrugations.

COVERED DISH.—Robert L. Johnson, Hanley, England. This is a shallow outwardly flaring dish, the shape of the cover conforming to the upper portion of the body, with curved horizontal handles at the ends of the body, all appropriately ornamented.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS, ETC.

THE STANDARD MANUAL OF SODA AND OTHER BEVERAGES. A treatise especially adapted to the requirements of druggists and confectioners. By Emil Hiss, Ph.G. Over fifteen hundred formulas. Chicago: G. P. Engelhard & Company. 1897. Pp. 242. 8vo. Price \$4.

What has long been needed is a thoroughly practical book of formulas for soda and other beverages. There have been a few books published on this subject, but in the main they are impracticable, largely because their compilers were neither chemists nor practical manufacturers of soda water. The present work is prepared on a

proper plan. Special contributors furnished formulas and they have been edited by a competent chemist. The result is highly satisfactory. There are nearly fifteen hundred formulas, including the very latest flavors of beverages. The soda water business can be greatly extended by careful attention to details and it gives a handsome return to the pharmacist for his trouble.

A HANDBOOK FOR CHEMISTS OF BEET SUGAR HOUSES AND SEED CULTURE FARMS. Containing selected methods of analysis, sugar house control, reference tables, etc. By Guilford L. Spencer. First edition. First thousand. New York: John Wiley & Sons. London: Chapman & Hall. 1897. Pp. 475. Price \$3.

The beet sugar industry promises to be very important in the United States, and the literature in English upon the subject, which was deficient a few months ago, is now being increased by several admirable works, of which the present is not the least. The author is connected with the Department of Agriculture Washington, D. C., and is well acquainted with the subject. We feel sure an examination of this work would be of value, not only to the sugar chemist, but to the general chemist as well.

MANUAL OF ASSAYING GOLD, SILVER, LEAD, COPPER. By Walter Lee Brown. Seventh edition. Chicago: E. H. Sargent & Company. 1897. Pp. 533. Price \$2.50.

This is a valuable book and is strictly up to date, and those who are thinking of going to the gold fields of the Klondike or elsewhere should not fail to possess a copy of this work. It is impossible in the limits of an ordinary notice to describe the methods which are adopted, but it is safe to say that no more valuable work exists upon the subject. The book is pocket size and is handsomely printed.

SLEEP: Its Physiology, Pathology, Hygiene, and Psychology. By Marie de Manacéine (St. Petersburg). Illustrated. London: Walter Scott, Limited. New York: Charles Scribner's Sons. 1897. Pp. 341. Price \$1.25.

This is a most interesting work, treating of the physiology, pathology, hygiene and psychology of sleep. It is published in Russian and in English. It is curious to see what an interesting book can be made upon the subject of sleep. One-third of our lives is passed in sleep, and it is fitting that we should know something at least of the hygiene of sleep, if not of its psychology. The bibliographies which are scattered through the work are very full and will prove of great value.

FESTSCHRIFT ZUR 38. Hauptversammlung des Vereins Deutscher Ingenieure. Cassel. 1897. Pp. 176.

This book deals with the various points of interest in the town of Cassel and the neighborhood and gives an account of the notable buildings and industrial establishments.

GOLD AND SILVER CURRENCY. In the light of experience, historical, economical and practical. A series of papers written for the Travelers' Record. Hartford, Conn.: The Case, Lockwood & Brainard Company. 1896. Pp. 70.

This is a series of papers written for the Travelers' Record by Mr. James T. Batterson, president of the Travelers' Insurance Company of Hartford, Conn., whose large experience in matters of finance specially fits him for the task of writing on gold and silver as currency.

IOWA GEOLOGICAL SURVEY. Vol. VII. Annual report, 1896, with accompanying papers. Samuel Calvin, State Geologist; A. G. Leonard, Assistant State Geologist. Des Moines. 1897. Pp. 555. 4to.

LITTLE MASTERPIECES: POE, IRVING, HAWTHORNE. Edited by Bliss Perry. New York: Doubleday & McClure Company. Cloth, 30 cents; full leather, 60 cents.

This series, each volume of which includes a discriminating selection of the characteristic short pieces of well known authors, is most daintily got up, the authorized text being used in all cases, with a short introduction by the editor. The volumes are small enough to be conveniently carried about in one's pocket, to contribute to the enjoyment of a leisure hour wherever one may happen to be—an enjoyment which is enhanced by the fact that their printing and style are in such excellent taste. Each volume contains a beautiful picture of the author from whose works the selections are made.

EASY LESSONS IN MECHANICAL DRAWING AND MACHINE DESIGN. By J. G. A. Meyer. Quarto, in 24 parts. Price 50 cents each.

The eighth number of this valuable work and reference for the draughting room, as well as a self-instructing guide to the student and amateur, has just been issued.

POPULAR SCIENTIFIC LECTURES. By Ernst Mach. Translated by Thomas J. McCormack. Second edition. Revised and enlarged. Chicago: The Open Court Publishing Company. London: Kegan Paul, Trench, Trubner & Company. 1897. Pp. 382. Price \$1.

Prof. Mach has an international reputation as a professor of physics. He is now professor of the history and theory of inductive science in the University of Vienna. The subjects of his lectures are as follows: The Forms of Liquids; The Fibers of Corti; On the Causes of Harmony; The Velocity of Light; Why Has Man Two Eyes? On Symmetry; On the Fundamental Concepts of Electrostatics; On the Principle of the Conservation of Energy; On the Economical Nature of Physical Inquiry; On Transformation and Adaptation in Scientific

Thought; On the Principle of Comparison in Physics; On the Part Played by Accident in Invention and Discovery; On Sensations of Orientation; On Instruction in the Classics and the Mathematico-Physical Sciences. Appendixes. I. A Contribution to the History of Acoustics. II. Remarks on the Theory of Spatial Vision.

PHOTOGRAPHS FOR 1897. London: Dawbarn & Ward, Limited, 1897. Pp. 114. 8vo. Price 80 cents in cloth; 40 cents in paper.

This is a pictorial and literary record of the best photographic work of the year, compiled by the editors of the staff of The Photogram, assisted by Gleeson White. This publication is supposed to represent the pictorial side of photography in various parts of the world. In this respect, since it began and the subsequent years have proved it to be uniformly successful, especially from an artistic point of view. This excellence is fully maintained in the present volume for 1897. We note several of the landscapes and views on the river during foggy days, in which the English amateurs excel. Possibly the most striking photograph in the whole work is drawing the charge from the retort in the gas works. This would make an ideal subject for a realistic painter. In addition to examples of artistic photographs are to be found others showing the progress in Roentgen photography and the kinetograph, among the latter being a page or more of minute pictures representing the crowd of photographers leaving the convention hall at Yarmouth last summer. These are so distinct that noted personages may be readily picked out. It is a book whose annual appearance is always appreciated and is one of the best printed annuals that comes from London.

SIXTEENTH ANNUAL REPORT OF THE UNITED STATES GEOLOGICAL SURVEY TO THE SECRETARY OF THE INTERIOR. 1894-95. Charles D. Walcott, Director. Washington, 1896. 4to. Pp. 910.

The present volume contains the Director's Report and papers of a theoretic nature. It details the remarkable work which has been accomplished by this important bureau of the government. After examining this splendid volume, it is easy to see why the publications of the United States government are so much thought of abroad. Many of the articles in the report are of course only interesting to specialists, but anyone who is interested in science can easily spend an hour in examining it. The engravings adequately illustrate the work. There are 117 plates and 169 engravings in the text, besides valuable geological maps.

THE ARCHITECTS' DIRECTORY FOR 1897-98. Containing a List of the Architects in the United States and Canada. Together with a Classified Index of Prominent Dealers and Manufacturers of Building Material and Appliances. New York: W. T. Comstock, 1897. Fourth annual edition. Pp. 112. Price \$1.

This excellent little book contains a classified list of the architects of the United States and Canada, and as it is issued by the publishers of Architecture and Building, it certainly should be trustworthy.

THE DWELLING HOUSE. By George Vivian Poore, M.D., F.R.C.P. London: Longmans, Green & Company, Pp. 178. \$1.25.

The proper sanitation of dwelling houses is a leading subject in this handbook, a great portion of whose contents have been previously published in papers delivered before the Royal Institution, the British Medical Association, etc. Its illustrations and comments relate almost exclusively to the ideas and practice of English builders.

APPLIED MECHANICS. A Student's Treatise in Mechanical and Electrical Engineering. By John Perry, M.E., D.Sc., F.R.S. London: Cassell & Company, Limited. Pp. 678. Price \$3.50.

For students who have time to work experimental, numerical and graphical exercises, and who would like to review an entire course of instruction in applied mechanics, this volume presents the ready means, as it embraces a two years' course of such lectures at the Finsbury (London) Technical College. All mechanical and electrical engineering students in their first year have two lectures a week, and the substance of these lectures is here printed in large type, while the mechanical engineers had three lectures a week in their second year, and these are printed in small type, the whole forming a volume containing a great amount of technical instruction, chemical and building students also attending in the mechanical department. The Appendix contains many useful tables.

A NEW ILLUMINATED EDITION OF THE HOLY BIBLE, brought out by the American Bible Union, 230-238 South Eighth Street, Philadelphia (copyrighted by Frank E. Wright), presents a wealth of illustration such as, we believe, has never before been attempted in a volume designed for general circulation, and offered at popular prices. The text conforms to that of the Oxford Bible, of the University Press, Oxford, with full marginal references and a Concordance. The work is embellished with 800 pictures, designed not only to give the Bible student all possible assistance to the proper understanding of the Sacred Word, but to be faithfully and artistically illustrative of the text, as it has been interpreted at various times in the long period during which the Bible has been looked upon as the first of all books. The pictures also cover oriental scenes of many types and all ages of the world, including representations of recently discovered ancient monuments, with their almost undecipherable hieroglyphics, and fragments of papyrus manuscripts which are now the objects of study by the most learned scholars. The typography and mechanical execution leave nothing to be desired, the type being large, clear and delightful to the eye, while all of the several types of binding in which the work is offered to the public, from the silk cloth to the full turkey, are of the same high character, as befits an edition de luxe.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Marine Iron Works. Chicago. Catalogue free.
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The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, \$4. Munn & Co., publishers, 361 Broadway, N. Y.

Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question. **Inquiries** not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

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Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(7278) X. asks: Will you please give me through your column of Notes and Queries a receipt for making a hectograph composition and also a hectographic ink? I would like something better than the plain glue and glycerine composition, and also for an ink that would not rub and smear. A. Formulas for pads, also inks, are given in SUPPLEMENT, Nos. 1071, 1092, 1110 and 1119; price 10 cents each by mail.

(7279) W. R. asks (1) how a drum armature can be wound so that it can be connected to a two segment commutator. A. Connect the coils on one side in series end to end; also on the other side, and join the ends to the two part commutator; but there is no advantage in doing it. 2. What is the claim made for the drum armature over the shuttle? A. With a drum armature as many impulses of current flow into the line for each revolution as there are coils, and the current is rendered even and uniform. With a shuttle armature there is a decided fluctuation of current at the same speed, since there is but one coil. This is not a claim, but a fact. 3. What is the size and sustaining power of the smallest electromagnet ever made? A. We have not at hand the accounts of small magnets. You can find accounts of very small electromagnets which sustained very large weights in "Lectures on Electricity," by Prof. George Forbes, price \$1.50 at this office. 4. In the SUPPLEMENTS describing the simplified Holtz machine, can the curved rod, G, forming the bearing for the sleeve, C, be placed in front of the revolving disk, or must it form the bearing for the sleeve? A. Make either arrangement, only let there be a firm support for the revolving parts. 5. Does it make any difference if the revolving plate is back instead of in front of the stationary? A. The side on which the discharge balls are is the front. It is much more convenient that the revolving plate should be on this side. There is also much less leakage. 6. Can a sal ammoniac battery be made with copper and zinc for the elements? A. Yes; but a very poor one, too poor for service. It gives less than one volt.

(7280) W. J. W. asks: Please inform me through your valuable paper how to resolve a looking glass? A. Valuable articles on this subject are contained in our SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 105, 121, 895 and 1000; price 10 cents each by mail.

(7281) F. H. M. writes: I wish to enlarge dynamo of which you give plans in SCIENTIFIC AMERICAN SUPPLEMENT, No. 600, to twice the dimensions given in paper. Would you kindly answer the following questions through the columns of your valued paper the SCIENTIFIC AMERICAN? 1. Should I use 48 divisions on commutators, or 24? A. The number of coils on the armature should not be changed. Wind 24 coils as before. 2. If 48 divisions are used on commutator cylinder, would it be necessary to use same number of divisions on armature core? A. Yes. 3. By doubling dimensions of dynamo gives it four times its capacity; using 14 wire on armature, 12 wire on field, would it run 32 1/2 candle power lamps more or less? A. Yes. 4. Could not the top of field, be cast in one piece instead of two, and bolts run down through field waists connecting all the field firm? If so, what size bolts, diameter? A. The principle of construction is to have as few joints in the castings as possible, as every joint causes some leakage. The top may be in one piece, and bolted as you suggest; 3/4 inch bolts may be used.

(7282) F. S. G. writes: I have three Crowfoot gravity batteries on a short telegraph line; to charge them I put in 8 ounces of blue vitriol in each and filled them up with water, then to start the action I

added 2 ounces of sulphate of zinc. I short circuited them, but the blue line will not come up any higher than the middle of the copper. What is the matter, and how can I remedy it? The way they are now, the three of them will not work one sounder. A. Fill the copper sulphate crystals in till the copper is covered. Then fill the jar with water till the zinc is covered. Short circuit for a few hours till the solution is clear like water to a point below the zinc. Your trouble is that you have not used blue vitriol enough. It is not necessary to use any sulphate of zinc in starting the gravity battery. It will form quite soon enough and will then have to be got rid of.

(7283) A. M. asks what the different compositions in the carbon for the brushes and arc lights are cemented together with. Would silicate answer the purpose? A. We are not able to give formulas as used by the different manufacturers of carbons; but the ground carbon powder is usually mixed with a sirup of sugar and gum and shaped by pressure. They are then baked in an oven to carbonize the adhesive substances. The details of the process are considered trade secrets. The Carre carbons are said to contain of powdered coke 15 parts, calcined lampblack 5 parts, special sirup 7 to 8 parts, mixed with water, moulded and dried in a crucible.

(7284) J. C. P. writes: I have a dynamo giving a current at terminals of 60 volts, 16 amperes. I wish to light a small Foucault arc lamp carrying 1/4 inch carbons. 1. What resistance should I introduce in series with the same, dynamo running shut, to get the most satisfactory results, i. e., quiet arc? A. The voltage and current taken by an arc lamp vary with the length of the arc, when properly lighted. Measurements with 1/4 inch carbons gave these results:

Amperes.	Volts.
9	35
85	40
65	50

Assuming your smallest drop then in the arc to be 35 volts, you will need to provide for 25 volts and 9 amperes in the resistance box. Apply Ohm's law to this:

$E = R \times C$; or $R = \frac{E}{C} = 3 \text{ ohms}$. The lamp has the other 4 ohms which are needed to pass 9 amperes.

$R = \frac{E}{C} = 4 \text{ ohms}$ nearly. The resistance box should allow of varying the resistance from the smallest to the largest current required in your work. 2. Carbons seem to tend to burn to a slim pencil point. Why? A. Your lamp gets too much current. 3. In my 90° arc lamp, taking current of 40 volts and 12 amperes with cone carbons, a horn grows out on negative carbon and tends to short-circuit the arc. Why is this? How can it be avoided? A. By giving the lamp more resistance in box, and so less current.

(7285) M. L. F. asks for the best receipt for a powder or dry mixture fire extinguisher—something to throw into the fire that will put it out, and that will keep a long time without losing its strength. A. Vienna Fire Extinguishing Agent: A solution of 5 parts ferrous sulphate (copperas), 20 parts ammonium sulphate, 125 parts water. Johnstone's: Make a mixture of equal parts of pyrolusite (manganese dioxide), potassium chlorate, potassium nitrate. Moisten with water glass and press into a block. Place the block in a pasteboard box. Several boxes, connected by fuses, are suspended from the ceiling of a room.

(7286) W. J. A. says: A few evenings ago, a friend of mine took out of his pocket a box containing long white "pills," tapered at each end. Laying one of these on the edge of a table, he applied a match and lit the end of it. Burning slowly, the "pill" transformed itself into gray material about 5 inches long. This gray matter seemed to writhe like the body of a snake while forming. After the "pill" stopped burning, their formation would fall in pieces if touched. Can you give me a receipt for making them? A. Pharaoh's serpents are made as follows: One grain of dry mercury sulphocyanide is mixed with some gum tragacanth which has previously been soaked in hot water. When the gum is completely softened, it is transferred to a mortar and the mercury sulphocyanide (in fine powder) is mixed with it by aid of a little water, so as to turn out a somewhat dry pill mass. This is then formed and cut into pellets of the desired size, which are dried on glass. These are very poisonous, and must be handled with care. Do not inhale the fumes.

(7287) G. S. M. asks: Can aluminum be used in castings for a gasoline engine of 1 horse power? If not, why? Could I save any weight by using brass or gun metal instead of iron? A. Pure aluminum can be used in many of the parts of a 1 horse power gasoline engine. If lightness is the principal object: An alloy of 90 parts of aluminum, 9 parts of silver, 1 part of copper—all by weight—makes a very hard but workable metal, suitable for cylinder, piston and valves. The specific gravity of this alloy is but very little more than pure aluminum. The cylinder could be covered with a thin sheet metal water jacket, and thus make a very light and beautiful engine. This alloy makes close grained castings and can be easily soldered.

(7288) W. M. Z. asks: 1. How fast will air travel through a pipe leading into a vacuum? A. The theoretical velocity with which air will flow into a vacuum if wholly unobstructed, is 1,347 feet per second. The coefficient for an orifice is 0.707, which limits the quantity value to 952 feet per second. The friction of the air in the pipe still further retards the flow according to its length. 2. How much in bulk will air compress under different pressures? A. There is no known limit to the compression of air at ordinary temperatures; 15,000 pounds per square inch has been attained without liquefaction. At a temperature of 220° below zero, Fahr., it liquefies at 573 pounds pressure per square inch. 3. How long will it take an air pump, say 10 horse power, to create a vacuum in a vessel of 1,000 cubic feet? A. A perfect vacuum cannot be made by any ordinary vacuum pump. The time of obtaining an approximate vacuum depends upon the relative volume of the pump and vessel, as also the speed of the pump; an approximate time, barring leakage, may be found by subtracting the pump volume from the volume remaining in the vessel for each stroke of the pump.

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